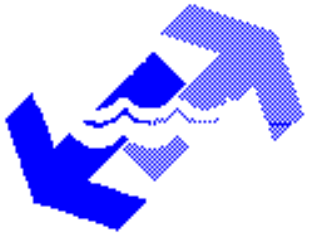
Columbus City Utilities Goes Green



Sustainability Impacted Decisions for New Wastewater Treatment Facility

Mark Sneve, Strand Associates, Inc.

June 5, 2008

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Project Background

New WWTP Driven by:

- Outdated WWTP
- Desire to reconstruct at remote location
- Planned reuse of existing site

Preliminary Engineering Report

- Sized WWTP
- Selected Processes
- Gained Acceptance and Approval

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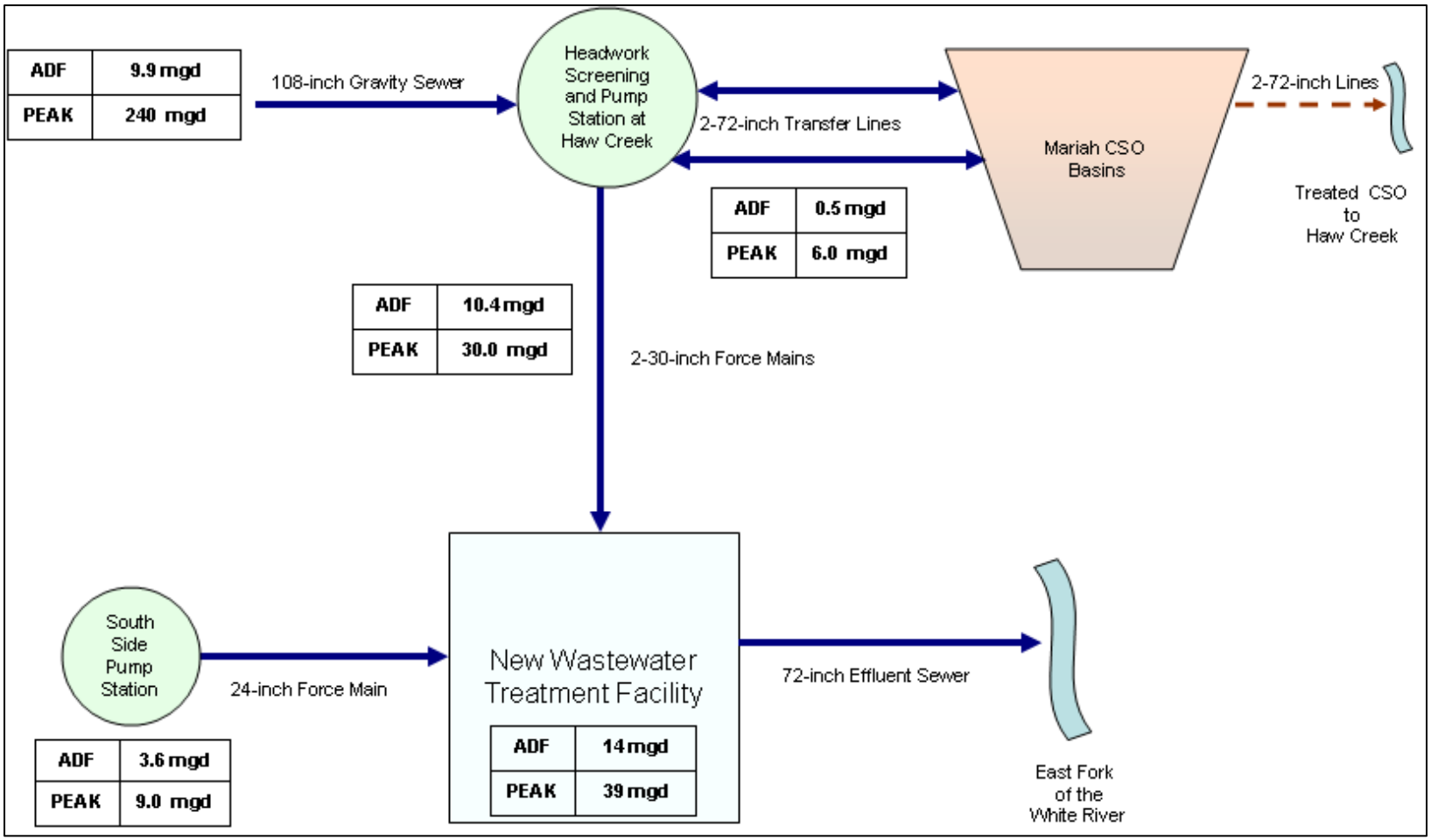
Overall CCU System Schematic



ADF – Average Daily Flow

Sustainability Considerations in PER

- Owner Input Sought
- Robust Alternatives Evaluation
- Sustainability Criteria
  - Energy Use
  - Biosolids Use and Quantity
  - Odor Control
  - Carbon Footprint

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Alternatives Evaluated

Alternative	Process Description
1A	Activated Sludge with Primaries, Anaerobic Digestion, and Dewatering
1B	Activated Sludge with Primaries, Anaerobic Digestion, and Liquid Land Application
2A	Activated Sludge without Primaries, Cannibal™, Aerobic Digestion, and Dewatering
2B	Same as Alternative 2A with the addition of Composting
3A	Oxidation Ditch without Primaries, Aerobic Digestion, and Dewatering
3B	Oxidation Ditch without Primaries, Cannibal™, Aerobic Digestion, and Dewatering
4	Activated Sludge with Primaries, No Digestion, and Dewatering
5	Activated Sludge without Primaries, and Dewatering of WAS

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Process Alternatives Analysis

	Alternative							
Processes that Vary between Alternatives	**1A**	**1B**	**2A**	**2B**	**3A**	**3B**	**4**	**5**
Primary Clarifiers	X	X					X	
Conventional Activated Sludge Tanks	X	X	X	X			X	X
Oxidation Ditch					X	X		
Cannibal™ Process			X	X		X		
Anaerobic Digesters	X	X						
Aerobic Digesters			X	X	X	X		
Sludge Thickening	X	X	X	X	X	X		
Dewatering Centrifuges	X		X	X	X	X	X	X
Compost Facilities				X				

Evaluation of Alternatives

- Conduct workshop with CCU Management and Staff
- Developed "Short List" of Process Alternatives to Evaluate (8 Alternatives Evaluated)
- Developed Criteria Rankings of Each Alternative
- Recommend Selected Plan

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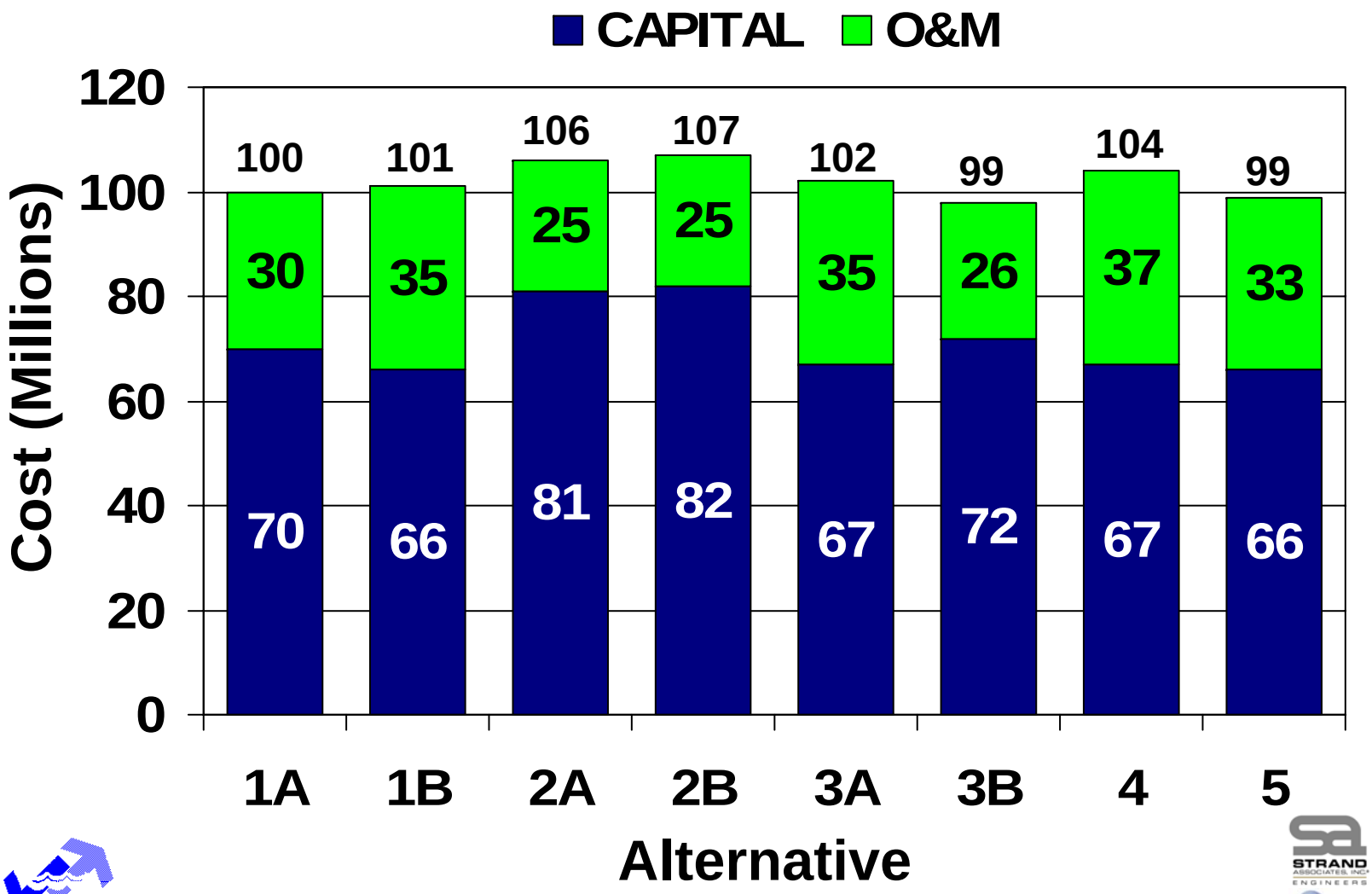
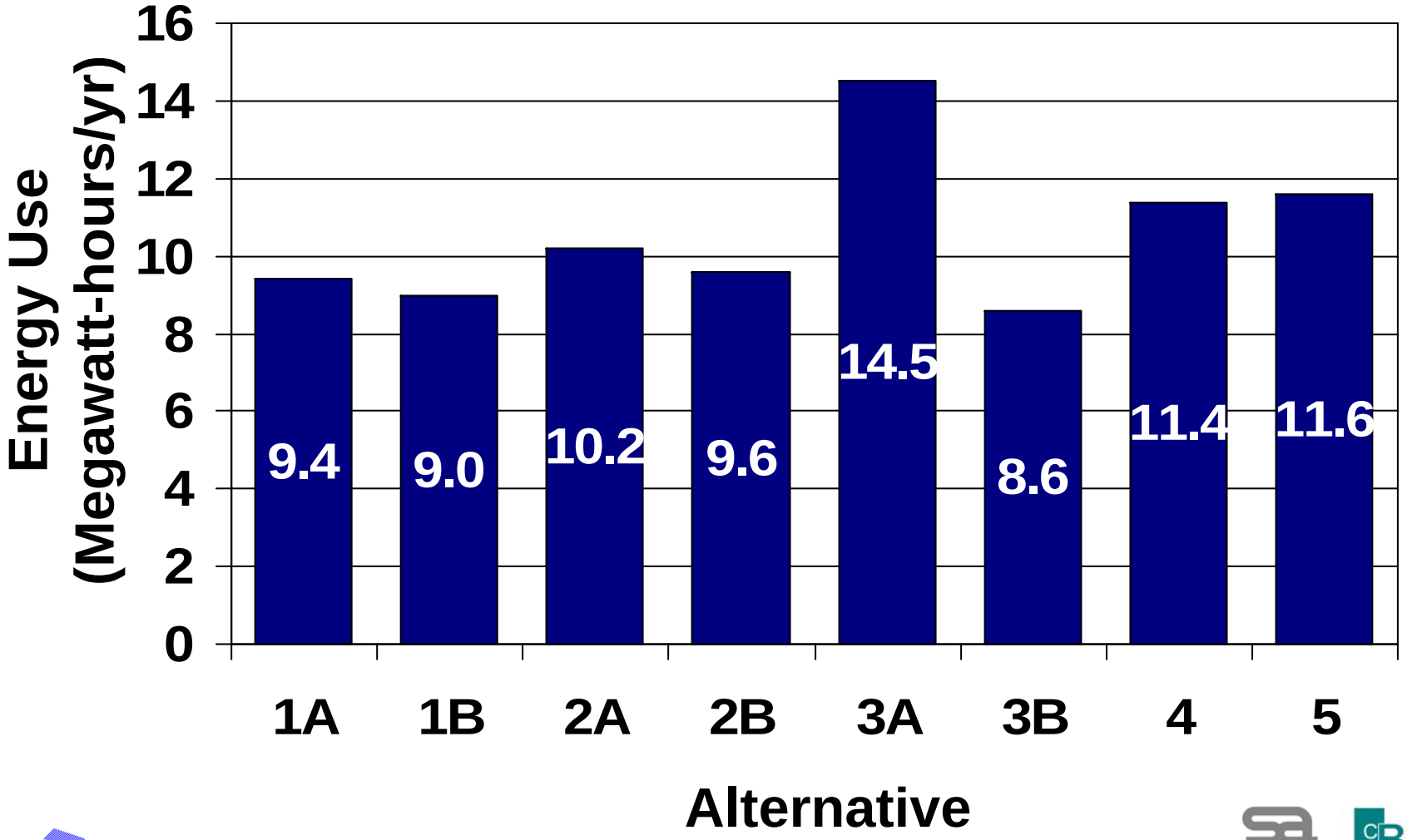
Present Worth Cost Comparison



Energy Use Predicts Carbon Footprint



Based on PRO2D™ Model results at design conditions

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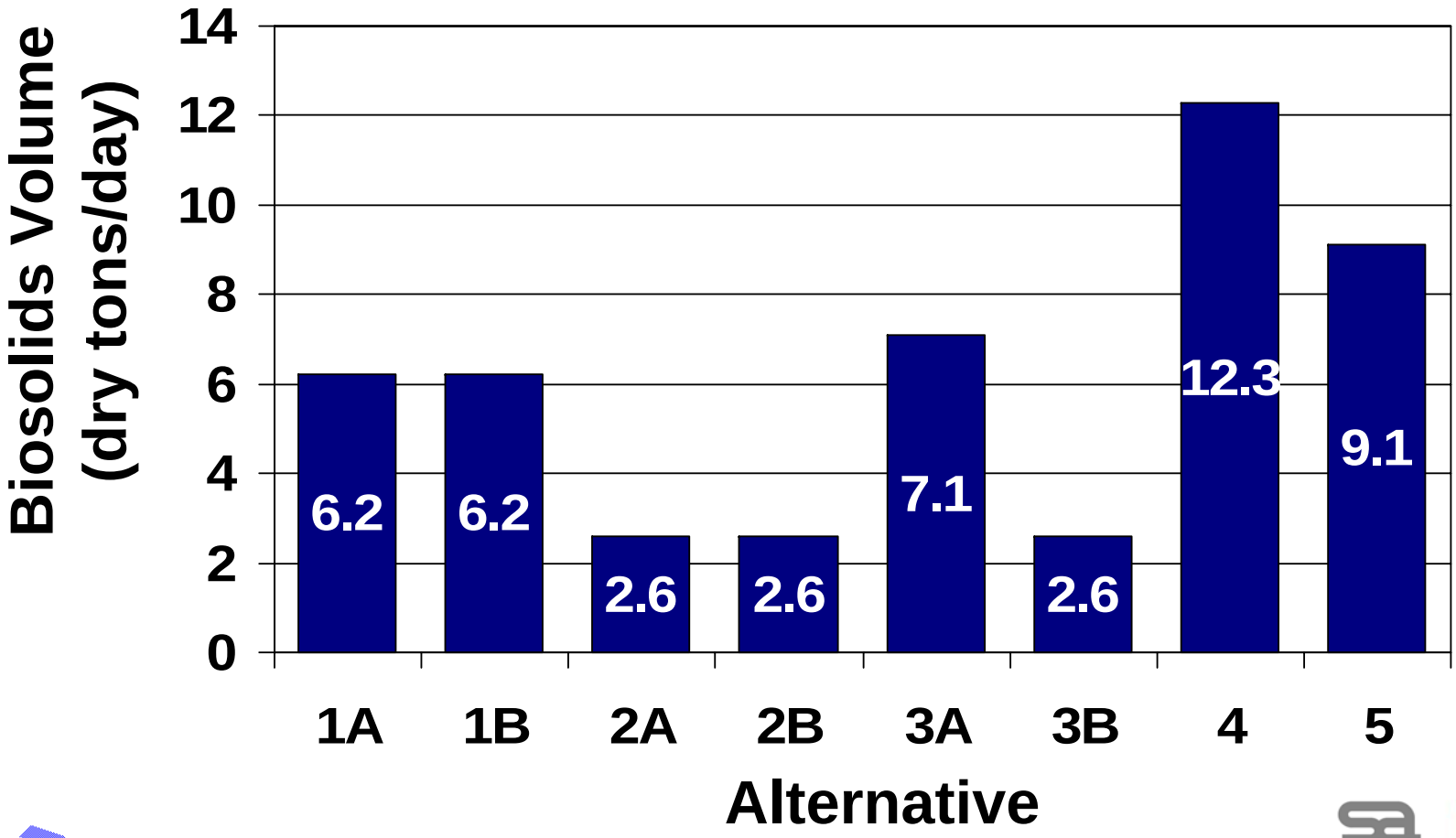
Predicted Biosolids Volume….

….the tail that wags the dog



Based on PRO2D™ Model results at design conditions

Qualitative Analysis of Alternatives

Criterion (Rank 1-10)	Weight
Regulatory Compliance	1.0
Contingency Capacity	0.9
Quality of Biosolids	0.7
Odor Control	1.0
Worker Health and Safety	1.0
Expandability	0.7
O&M Complexity	0.9
Volume Reduction	0.7
Stakeholder Interests	0.8
Public Acceptance	1.0
Carbon Footprint	0.5
Process Risk	1.0

Benefit Score	
1A	66.0
1B	64.4
2A	68.9
2B	69.9
3A	**70.7**
3B	69.9
4	56.9
5	56.9

BENEFIT/COST COMPARISON	
1A	0.66
1B	0.64
2A	0.65
2B	0.65
3A	0.69
3B	**0.71**
4	0.55
5	0.58

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Recommended Alternative

- **Alternative 3B is the most Economical Alternative**
  - Oxidation Ditch without Primaries
  - Cannibal™
  - Aerobic Digestion
  - Dewatering
- **Alternative 3B will result in the lowest amount of Biosolids produced.**
  - Biosolids handling accounts for 27% of existing O&M Costs

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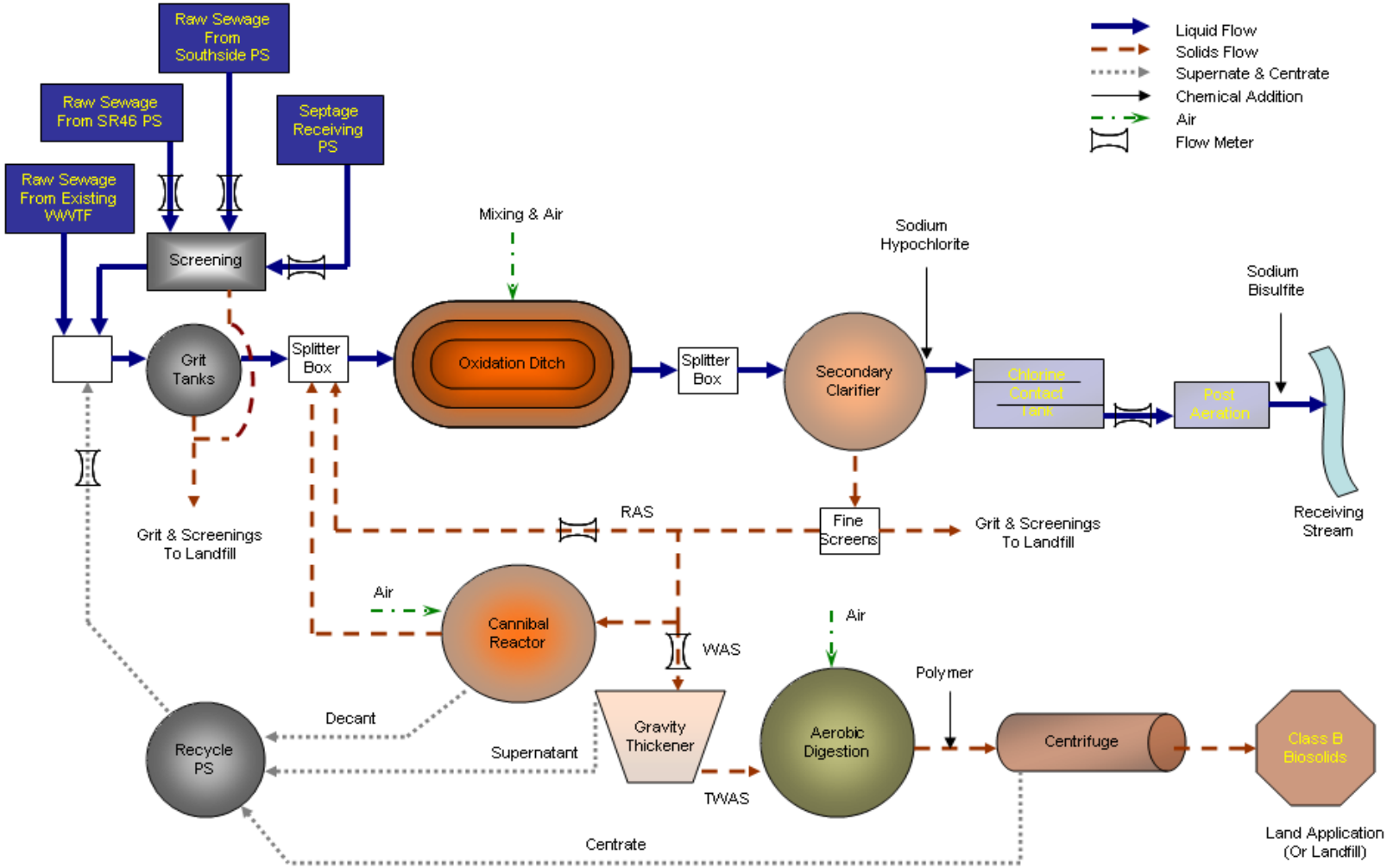
Recommended Plan Process Schematic



Oxidation Ditch without Primaries, Cannibal™, Aerobic Digestion, Dewatering

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Developing “Green and Sustainable Design” Incentives

- Approximately 28% of overall construction costs implement “green design” and may qualify for SRF loan interest rate savings
  - Cannibal™ System,
  - Energy Savings in Operation of Ditch
  - LEED Certified Building,
  - Biological Odor Control and
  - portions of other processes.

- This interest rate reduction can provide nearly $1.3 Million in savings over the 20 Year Life of the SRF Loan

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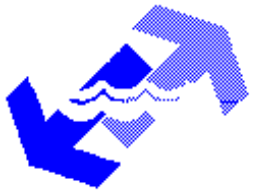
ACKNOWLEDGMENTS



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